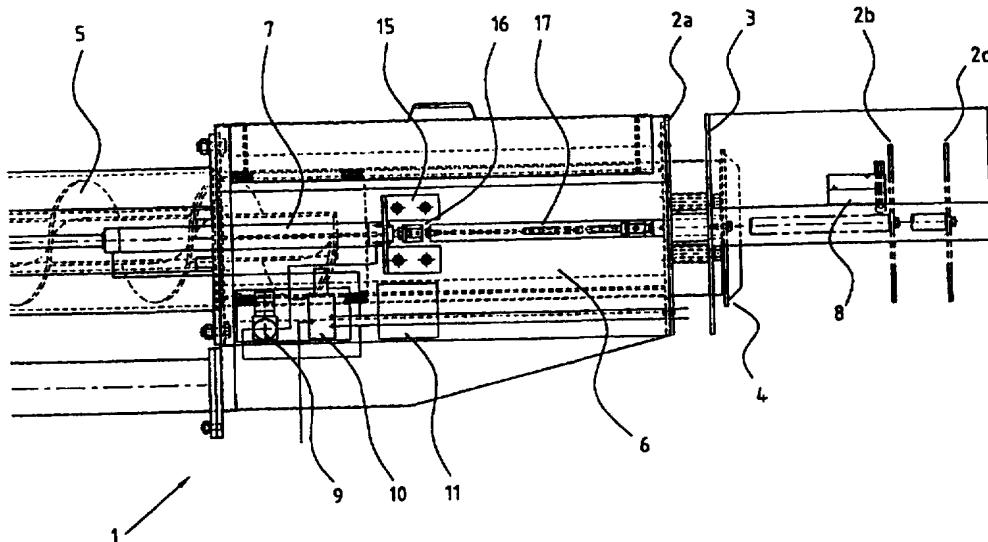




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: SCREW PRESS HEAD



## (57) Abstract

A dewatering press (1) includes a pressing head plate (2a) which is moveable in response to pressure exerted by material conveyed towards it, such as by a screw (5). The position of the pressing head plate (2a) is controlled by retaining means, such as pneumatic or hydraulic arms (7), so as to exert a substantially constant, preset back pressure against the material. The position of the pressing head plate (2a) ranges from a first position (2b) which is distal from the conveying means, and a second position (2c) at which pressed material may be released. Actuation means, which may be a switch (8) actuated by the position of the pressing head plate (2a), when actuated allows the pressing head plate (2a) to move substantially freely between those positions (2b and 2c). A method of dewatering is also described.

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## SCREW PRESS HEAD

### **BACKGROUND**

This invention relates to presses suitable for dewatering of screenings from, for example, waste water, industrial waste, sewage or the like following screening.

In the field of waste-water and industrial screening, there is frequently a need for the screenings, ex-screen, to be discharged in a substantially dewatered state, for example, at an air-dry consistency of e.g. 10%AD. As many screenings are transported for burial or to be reused in the particular plant, it is important that they be dewatered as much as practically possible.

Existing dewatering press heads have typically comprised weighted head plates which are hinged typically at the top, plates which are mounted using compression springs against which the screenings will be pressed, or crosshead screws, variable pitch operating screws or tapered screws which are narrower at the discharge end than the feed end.

All of these mechanisms tend to suffer from the disadvantage that pressing occurs at a variable pressure, according to the loading of product into the press, and the pressure is difficult to control.

Even when dealing with a single product such as sewage sludge, the physical makeup of the screenings can vary significantly from location to location.

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It is therefore desirable to have a press head design which can be affixed to the end of the mechanism conveying the material, for example the screw press barrel, and which can be altered to suit the nature of the screenings presently being pressed. It is also desirable that the mechanism can be set up on site.

Ideally, the press head will be so designed that the operation of the press can be changed to suit the type of product which is being conveyed and dewatered.

#### OBJECT

It is therefore an object of the present invention to provide a press head which will at least meet some of the foregoing desirable characteristics and go at least some way to overcoming the aforementioned disadvantages, or which will at least provide the public with a useful choice.

#### SUMMARY

Accordingly, in a first aspect, the invention consists in a dewatering press, comprising:

a pressing head plate;  
conveying means for conveying material to be pressed towards said pressing head plate;

retaining means for controlling the position of said pressing head plate; said pressing head plate being moveable in response to pressure exerted by said conveyed material, through a continuous range of positions in which said pressing head plate is retained by said retaining means so that a substantially constant, preset back pressure is exerted against said conveyed material, and between a first position being the extremity of said range distal from said conveying means, and a second position at which pressed material may be released or removed; and an actuation means, which when actuated permits said pressing head plate to move substantially freely between said first position and said second position.

Preferably, said retaining means comprise one or more pneumatic or hydraulic arms.

Preferably, said actuation means comprises a switch serving to release pressure in said arms.

Preferably, said actuation means is actuated by the position of said pressing head plate.

Preferably, said actuation means is actuated by said pressing head plate reaching said first position.

Preferably, said conveying means comprises a screw.

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In a second aspect, the invention consists in:

a method for dewatering material, said method comprising the steps of:

conveying said material towards a pressing head plate;  
controlling the position of said pressing head plate within a range so as to exert a substantially constant, preset back pressure against said material as said material is conveyed against said head plate;  
and when said pressing head plate reaches a preset first position, releasing said back pressure, so as to allow said pressing head plate to move away from the inlet of said material into a second position, at which pressed material may be removed or released.

In a third aspect, the invention consists in a method for dewatering material, comprising the operation of a dewatering press as hereinbefore described.

#### **BRIEF DESCRIPTION OF DRAWINGS**

One presently preferred form of the invention will now be described with reference to the following drawings:

Figure 1 is a plan of a press head in accordance with the invention;

Figure 2 is a side elevation of the press head of Figure 1.

**DETAILED DESCRIPTION OF PREFERRED EMBODIMENT**

In accordance with the invention, a dewatering press, indicated generally by arrow 1, is provided.

The pressing head plate 2a may preferably be backed by a doubling plate 3 and back pressure plate 4.

The material to be pressed, for example waste-water or industrial screenings, sewage sludge screenings or the like, is conveyed to the press head by conveying means, shown in the figures as a feed screw 5. The conveying means needs to be of such construction as to substantially prevent backflow of the screening material as it is conveyed into the press chamber 6. The screw 5 conveys the material to be pressed towards the pressing head plate 2a.

The press head as shown, would typically include a screw varying in size from 100mm diameter to 600mm diameter, driven by power hydraulics, electrically driven speed reducers or the like.

The pressing head plate 2a is moveable in response to pressure exerted by the conveyed material.

The pressing head plate may, for example, operate on slides to allow it to move in and out through the various positions.

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The position of the pressing head plate is controlled by retaining means, such as pneumatic rams 7.

Ram 7 via self-aligning coupler 16 activates piston 17.

Hydraulic rams or other controlling means may also be used as will be apparent to one skilled in the art. In this preferred form of the invention as illustrated in the figures, two rams have been provided. However, one ram, or more than two rams, may also be used in certain configurations of the invention.

The pressing head plate when in position 2a exerts a back pressure against the conveyed material. The degree of back pressure is controlled by way of the rams 7. For example, the compressed air or power hydraulics may be controlled by easily accessed operating valves or screw adjustments. Typically, the pressure applied to the plate would be operated by actuators on operating pressures typically ranging from 3psig to 100psig depending on the application, i.e. on the particular material being pressed. The amount of back pressure that would be applied would vary considerably between for example sewage screenings, wood pulp fibres and vegetables matter from a canning works.

When the press is being commissioned for a particular application, the pressure and the pressing performance are closely watched and monitored and controlled by valve or screw adjustment of the retaining means, for

example, the rams 7. Thus, the pressure head loading can be varied within seconds. The operator selects and sets the pressure being applied to best suit the particular product and the dewatering requirement.

The pressing head plate is moveable in response to pressure from the material conveyed against it, through a range between the position shown by 2a and position 2b.

Through this range of positions 2a and 2b, back pressure against the material to be pressed is maintained by control of the rams 7. Water or liquid is forced out and collected and/or discharged by known means.

As the material is screwed towards the press head, the material pushes against the plate, forcing the plate 2a away from the conveying means 5 towards position 2b. The control of the rams ensures that the back pressure is applied at the preset constant pressure regardless of the rate of infeed. This may be compared with current designs of screw presses or drainer screws where the pressure varies according to the infeed rate.

At position 2b, which is the extremity of the back pressure range, called the first position, an actuation means, for example limit switch 8, is triggered, which signals that the plate has reached position 2b. The back pressure is then taken off the plate by releasing the rams, allowing the plate to move to position 2c substantially freely under pressure from the slug of pressed material which has formed. The pressed material is then allowed to crumble or break away and is removed or released from the press.

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The pressing head plate 2c then moves back to position 2a, controlled by the rams, ready to receive more material from conveying means 5.

The press overall may be controlled by various controlling mechanisms including, for example, air pressure regulator 9, solenoid valve 10, and electronics contained in box 11.

In the preferred form of the invention as shown, the movement of the plate is also controlled by bush/guide 12 and spacer 13, and the release area is provided with cover 14. However, it will be noted that these features are details of construction which may be varied according to a particular required configuration, as will be understood by one skilled in the art. These particular features are illustrated and described by way of example only.

Thus it can be seen that a dewatering press is provided by the invention which provides a constant preset pressure, rather than a varying pressure, and which is able to be varied in terms of the pressure exerted, to suit the particular material being pressed. The mechanism is also able to be assembled and added to existing screening apparatus, in situ.

Where in the foregoing description reference has been made to specific components or integers of the invention having known equivalents then such equivalents are herein incorporated as if individually set forth.

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Although this invention has been described by way of example and with reference to possible embodiments thereof it is to be understood that modifications or improvements may be made thereto without departing from the scope or spirit of the invention.

**WHAT WE CLAIM IS:**

1. A dewatering press, comprising:
  - a pressing head plate;
  - conveying means for conveying material to be pressed towards said pressing head plate;
  - retaining means for controlling the position of said pressing head plate; said pressing head plate being moveable in response to pressure exerted by said conveyed material, through a continuous range of positions in which said pressing head plate is retained by said retaining means so that a substantially constant, preset back pressure is exerted against said conveyed material,
  - and between a first position being the extremity of said range distal from said conveying means, and a second position at which pressed material may be released or removed;
  - and an actuation means, which when actuated permits said pressing head plate to move substantially freely between said first position and said second position.
2. A dewatering press as claimed in Claim 1 wherein said retaining means comprise one or more pneumatic or hydraulic arms.
3. A dewatering press as claimed in Claim 2 wherein said actuation means comprises a switch serving to release pressure in said arms.

4. A dewatering press as claimed in any one of the preceding claims wherein said actuation means is actuated by the position of said pressing head plate.

5. A dewatering press as claimed in Claim 4 wherein said actuation means is actuated by said pressing head plate reaching said first position.

6. A dewatering press as claimed in any one of the preceding claims wherein said conveying means comprises a screw.

7. A method for dewatering material, said method comprising the steps of:

conveying said material towards a pressing head plate;  
controlling the position of said pressing head plate within a range so as to exert a substantially constant, preset back pressure against said material as said material is conveyed against said head plate;  
and when said pressing head plate reaches a preset first position, releasing said back pressure, so as to allow said pressing head plate to move away from the inlet of said material into a second position, at which pressed material may be removed or released.

8. A dewatering press substantially as hereinbefore described with reference to any one or more of the accompanying drawings.

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9. A method for dewatering material, comprising the operation of a dewatering press as hereinbefore described with reference to any one or more of the accompanying drawings.

10. A method for dewatering material substantially as hereinbefore described.

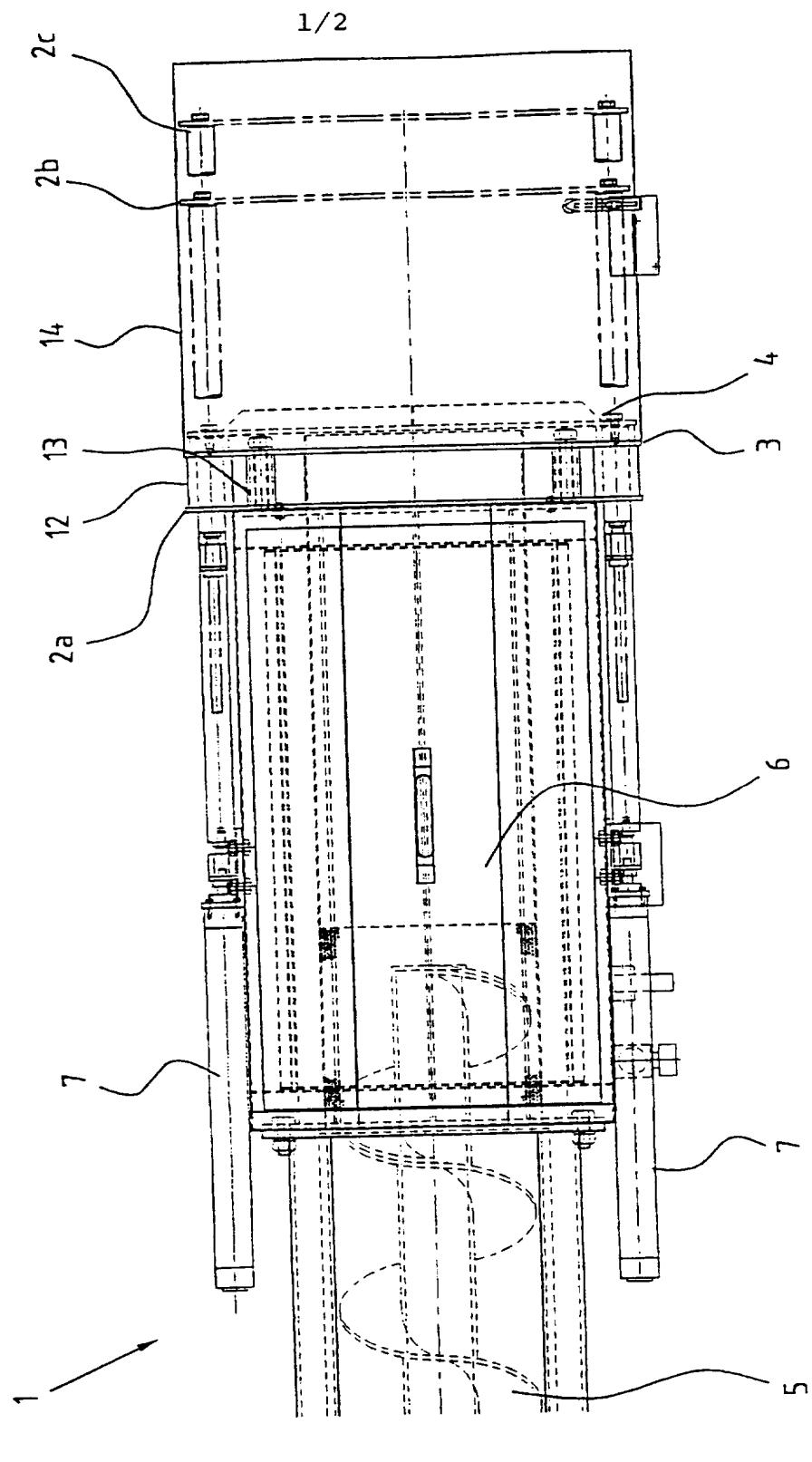


FIG.1.

2/2

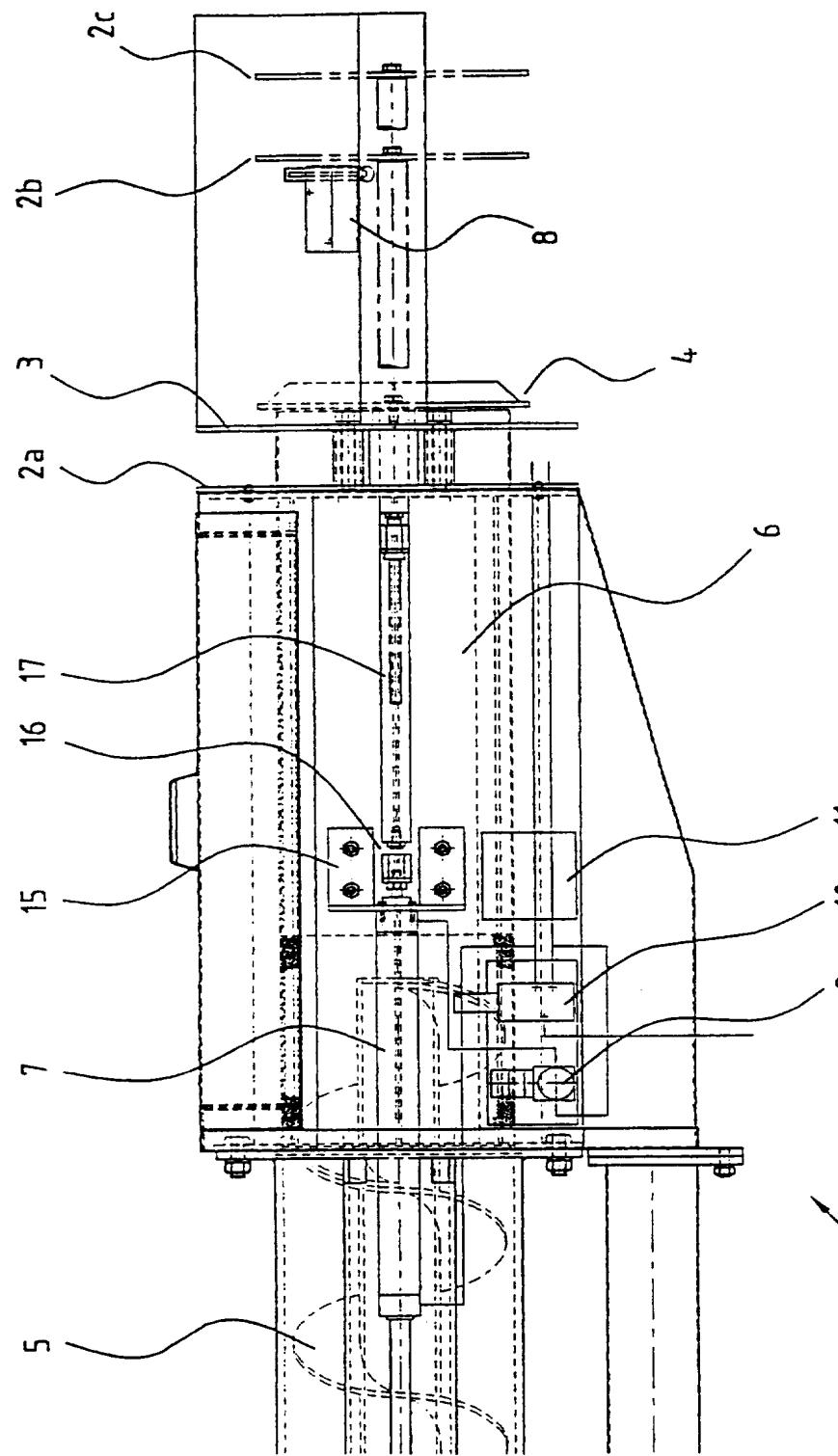


FIG.2.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ96/00145

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B30B 9/02

US CL :100/37, 45, 117, 147

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 100/37, 45, 117, 127, 147, 148, 191, 192, 251

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 1,135,309 A (MEAKIN) 13 April 1915, see figures 1 and 2.	1-5 and 7
A	US 4,253,390 A (HUNT et al) 03 March 1981, see figure 1.	1-5 and 7
A	US 5,137,489 A (BOSTER) 11 August 1992, see figure 1 and column 2, lines 31-49.	1-5 and 7
A, P	US 5,526,740 A (LEE) 18 June 1996, see figure 6.	1-5 and 7
A	JP 55-64999 A (MITSUBISHI JUKOGYO K.K.) 16 May 1980, see figure 3.	1-5 and 7

 Further documents are listed in the continuation of Box C. See patent family annex.

•	Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

13 MARCH 1997

Date of mailing of the international search report

25 MAR 1997

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**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/NZ96/00145

**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: 8-10  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  

Please See Extra Sheet.
  
3.  Claims Nos.: 6  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**  

The additional search fees were accompanied by the applicant's protest.  
No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/NZ96/00145

**BOX I. OBSERVATIONS WHERE CLAIMS WERE FOUND UNSEARCHABLE****2. Where no meaningful search could be carried out, specifically:**

Claims 8-10 are omnibus claims because in claims 8 and 9, the recitation "... with reference to any one or more of the accompanying drawings" and in claim 10, the recitation "... as hereinbefore described" each fails to point out what is included or excluded. Therefore a meaningful search of the claims cannot be carried out.